

Geometry *Essential Learning Outcomes*

The learner will:

Tools of Geometry

- identify and model points, lines, and planes.
- identify collinear and coplanar points and intersecting lines and planes in space.
- find segment and angle measures using segment and angle postulates.
- describe relationships between segments and angles (congruent, midpoint, segment bisector, angle bisector, perpendicular) and use the relationships to solve problems.
- identify special pairs of angles (vertical, linear pair, complementary, supplementary) and use their relationships to solve problems.

Exploring Lines and Planes

- develop midpoint and distance formulas using the coordinate plane.
- identify the relationships between lines or planes (parallel, perpendicular, skew, intersecting, oblique).
- name angles pairs formed by lines and a transversal.
- use properties of parallel lines to determine congruent angles and to find angle measures.
- find slopes of lines and use slopes to identify parallel and perpendicular lines.
- write equations of parallel and perpendicular lines.
- recognize angle conditions necessary to prove lines parallel.
- identify and use properties of perpendicular bisectors and angle bisectors.

Reasoning and Proof

- make conjectures based on inductive reasoning.
- analyze statements in if-then form (conditional statements).
- write the converse, inverse, and contrapositive of a conditional statement and determine the truth value of the statements.
- use properties of algebra and congruence to make and justify conclusions.
- use deductive reasoning with different styles of proofs to verify segment and angle relationships.

Triangle Properties

- identify and classify triangles by side and angle measures.
- determine the relationships among the measures of the interior and exterior angles of a triangle and apply these relationships.
- identify and use properties of isosceles and equilateral triangles.
- identify special segments (angle bisectors, perpendicular bisectors, medians, altitudes, midsegments) of a triangle, determine their relationships and apply those relationships to solve problems.
- recognize and apply properties of inequalities to the relationships between the sides and angles of a triangle.
- recognize and apply properties of inequalities between the sides and angles of two triangles.

Congruent Triangles

- identify congruent triangles and their corresponding parts.
- identify methods (SSS, SAS, ASA, AAS, HL) of proving triangles congruent.
- find missing sides of triangles and other figures based on congruence relationships.
- use deductive reasoning to prove corresponding parts of congruent triangles congruent.
- use triangle congruence to solve problems in real-life situations.

Polygons and Quadrilaterals

- identify, name, and classify polygons.
- find measures of interior and exterior angles of polygons.
- recognize and apply properties of the sides and angles of parallelograms.
- use properties of parallelograms to solve problems.
- recognize the conditions that ensure a quadrilateral is a parallelogram.
- identify special parallelograms(rectangle, rhombus, square), identify their properties, and apply the properties to solve problems.
- recognize and apply properties of trapezoids and special trapezoids.
- recognize the conditions that ensure polygons are congruent.

Similarity and Proportional Reasoning

- compute ratios and use proportions to solve problems.
- solve percent and probability problems.
- identify the conditions that ensure two polygons are similar.
- use properties of similar polygons to solve problems.
- recognize the conditions that ensure two triangles are similar.
- use similar triangles to solve real-life problems.
- identify proportional parts of a triangle and use them to solve problems.
- recognize and use proportional relationships of perimeters and other corresponding segments of similar triangles.

Right Triangles

- identify the geometric mean of two numbers.
- solve problems involving relationships between parts of a right triangle and the altitude to the hypotenuse.
- use the Pythagorean Theorem and its converse to solve problems.
- use the Pythagorean theorem to classify a triangle as acute, right, or obtuse.
- identify a pattern in the side lengths of special right triangles (45° - 45° - 90° , 30° - 60° - 90°) and use special right triangles to solve problems.
- find trigonometric ratios (sine, cosine, tangent) using right triangles and solve problems using these trigonometric ratios.
- solve problems involving angles of elevation and depression.

Transformations

- identify translation, reflection, rotation, and dilation transformations.
- use properties of reflections to find reflection images and relate reflections and line symmetry.
- use properties of rotations to find rotation images and identify figures with rotational symmetry.
- use properties of translations to find translation images.
- use algebra notation to define translations, reflections, and rotations.
- identify tessellations.
- use compositions of transformations and identify their properties.
- identify, use properties of, and determine the scale factor of dilations.

Circles

- identify and use parts of circles.
- recognize major arcs, minor arcs, semicircles, and central angles, find their measures and use their measures to solve problems.
- recognize and use relationships between arcs and chords to solve problems.
- recognize inscribed angles and use their properties to solve problems including inscribed polygons.
- identify and use properties of tangents to solve problems including circumscribed polygons.
- find measures of angles formed by segments or lines intersecting on a circle, inside a circle, or outside a circle (chords, secants, tangents).
- determine the equation of a circle.

Perimeter, Area, and Volume

- find perimeters and areas of triangles and quadrilaterals (including rectangles, squares, parallelograms, trapezoids, rhombi, and other quadrilaterals).
- identify regular polygons and find their perimeters and areas.
- find circumference and area of a circle and use them to find the length of an arc or the area of a sector.
- find perimeters and areas of composite figures.
- identify properties of areas of similar polygons and use the relationships to solve problems.
- relate nets to different solids.
- identify three dimensional figures, recognize different views of three-dimensional figures, and investigate cross sections of three-dimensional figures.
- find surface areas of prisms, pyramids, cylinders, cones, and spheres.
- use surface areas to solve problems.
- find volumes of prisms, pyramids, cylinders, cones, and spheres.
- use volumes to solve problems.
- identify properties of surface areas and volumes of similar figures and use the relationships to solve problems.